Prodigy InfoTech Internship

Task 4:

Analyse and visualize sentiment patterns in social media data to understand public opinion and attitudes towards specific topics or brands.

Sample Dataset: [Twitter Sentiment Analysis]

Analysation & Visualisation of sentiment patterns in social media data

Loading Libraries and Dataset:

```
[122]
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
from textblob import TextBlob
```

```
sns.set_theme(context='notebook', style='whitegrid', palette='Spectral')
```

```
[124]
!pip install textblob
```

```
Requirement already satisfied: textblob in /usr/local/lib/python3.10/dist-packages (0.17.1)
Requirement already satisfied: nltk>=3.1 in /usr/local/lib/python3.10/dist-packages (from textblob) (3.8.1)
Requirement already satisfied: click in /usr/local/lib/python3.10/dist-packages (from nltk>=3.1->textblob) (8.1.7)
Requirement already satisfied: joblib in /usr/local/lib/python3.10/dist-packages (from nltk>=3.1->textblob) (1.4.2)
Requirement already satisfied: regex>=2021.8.3 in /usr/local/lib/python3.10/dist-packages (from nltk>=3.1->textblob) (2023.12.25)
Requirement already satisfied: tqdm in /usr/local/lib/python3.10/dist-packages (from nltk>=3.1->textblob) (4.66.4)
```

```
[125]
col_names = ['Id', 'Entity', 'Sentiment', 'Tweet']
valid_data = pd.read_csv("/content/drive/MyDrive/Project_Datasets/Sentiment_Analysis/twitter_validation.csv", names=col_names)
train_data = pd.read_csv("/content/drive/MyDrive/Project_Datasets/Sentiment_Analysis/twitter_training.csv", names=col_names)
```

Understanding the shape of the data:

```
[126]
train_data.head()
```

	Id	Entity	Sentiment	Tweet
0	2401	Borderlands	Positive	im getting on borderlands and i will murder yo...
1	2401	Borderlands	Positive	I am coming to the borders and I will kill you...
2	2401	Borderlands	Positive	im getting on borderlands and i will kill you ...
3	2401	Borderlands	Positive	im coming on borderlands and i will murder you...
4	2401	Borderlands	Positive	im getting on borderlands 2 and i will murder ...

```
[127]
valid_data.head()
```

	Id	Entity	Sentiment	Tweet
0	3364	Facebook	Irrelevant	I mentioned on Facebook that I was struggling ...
1	352	Amazon	Neutral	BBC News - Amazon boss Jeff Bezos rejects clai...
2	8312	Microsoft	Negative	@Microsoft Why do I pay for WORD when it funct...
3	4371	CS-GO	Negative	CSGO matchmaking is so full of closet hacking,...
4	4433	Google	Neutral	Now the President is slapping Americans in the...

Data Cleaning:

[128]
```
# Check for missing values
train_data.isnull().sum()
valid_data.isnull().sum()
```

```
Id           0
Entity       0
Sentiment    0
Tweet        0
dtype: int64
```

[129]
```
# Checking the distribution of sentiment labels
train_sentiment_distribution = train_data.iloc[:, 2].value_counts()
valid_sentiment_distribution = valid_data.iloc[:, 2].value_counts()
train_sentiment_distribution,valid_sentiment_distribution
```

```
(Sentiment
 Negative      22542
 Positive      20832
 Neutral       18318
 Irrelevant    12990
 Name: count, dtype: int64,
 Sentiment
 Neutral       285
 Positive      277
 Negative      266
 Irrelevant    172
 Name: count, dtype: int64)
```

```
train_data.iloc[:, 1].nunique()
```

```
32
```

[131]
```
# Remove duplicate rows from the training set
train_data_cleaned = train_data.drop_duplicates()
```

```
# Drop rows with missing tweet/message values
train_data_cleaned.dropna(subset=[train_data.columns[3]])
```

	Id	Entity	Sentiment	Tweet
0	2401	Borderlands	Positive	im getting on borderlands and i will murder yo...
1	2401	Borderlands	Positive	I am coming to the borders and I will kill you...
2	2401	Borderlands	Positive	im getting on borderlands and i will kill you ...
3	2401	Borderlands	Positive	im coming on borderlands and i will murder you...
4	2401	Borderlands	Positive	im getting on borderlands 2 and i will murder ...
...	...	...	...	...
74677	9200	Nvidia	Positive	Just realized that the Windows partition of my...
74678	9200	Nvidia	Positive	Just realized that my Mac window partition is ...
74679	9200	Nvidia	Positive	Just realized the windows partition of my Mac ...
74680	9200	Nvidia	Positive	Just realized between the windows partition of...
74681	9200	Nvidia	Positive	Just like the windows partition of my Mac is l...

71656 rows × 4 columns

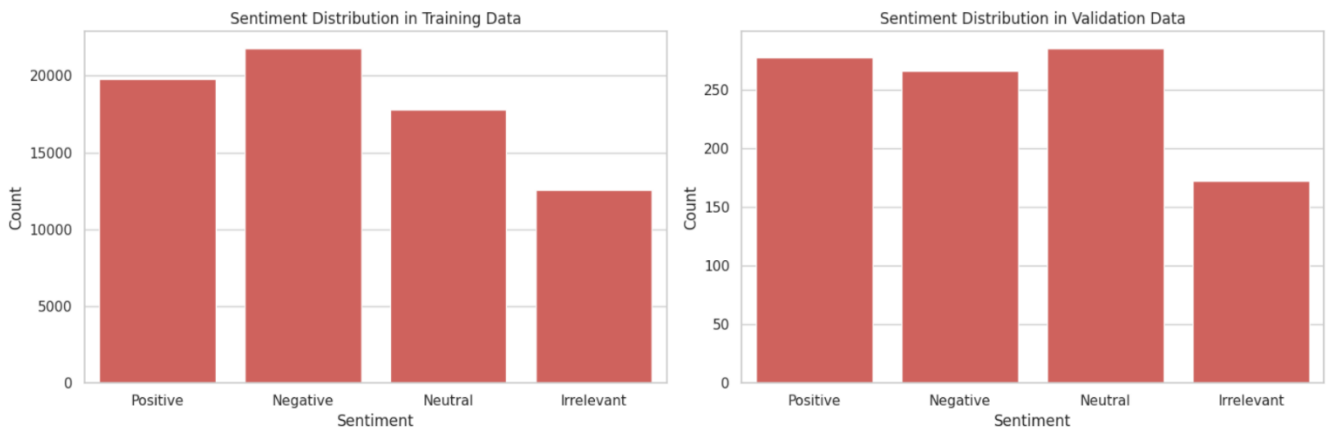
[133]

```python
# Verify the cleaning
remaining_duplicates_train = train_data_cleaned.duplicated().sum()
remaining_missing_train = train_data_cleaned.isnull().sum()

remaining_duplicates_train, remaining_missing_train
```

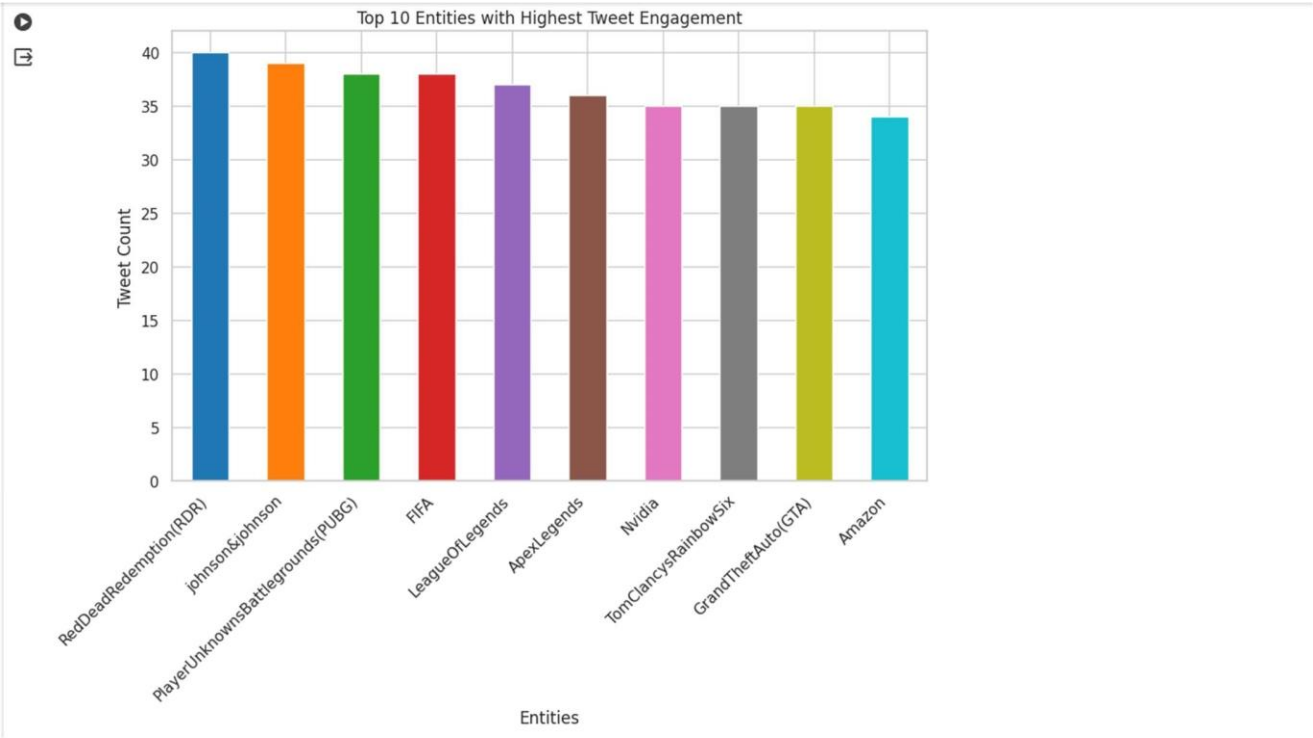
```
(0,
 Id             0
 Entity         0
 Sentiment      0
 Tweet        326
 dtype: int64)
```

Data Exploration:

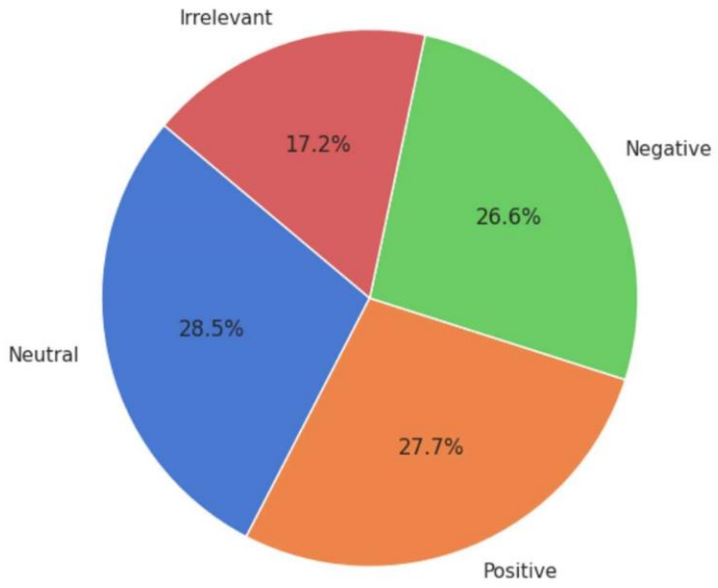
```python
# Set up the plots
fig, ax = plt.subplots(1, 2, figsize=(15, 5))

# Plot sentiment distribution for training data
sns.countplot(data=train_data_cleaned, x=train_data_cleaned.columns[2], order=['Positive', 'Negative', 'Neutral', 'Irrelevant'], ax=ax[0])
ax[0].set_title('Sentiment Distribution in Training Data')
ax[0].set_ylabel('Count')
ax[0].set_xlabel('Sentiment')

# Plot sentiment distribution for validation data
sns.countplot(data=valid_data, x=valid_data.columns[2], order=['Positive', 'Negative', 'Neutral', 'Irrelevant'], ax=ax[1])
ax[1].set_title('Sentiment Distribution in Validation Data')
ax[1].set_ylabel('Count')
ax[1].set_xlabel('Sentiment')

plt.tight_layout()
plt.show()
```



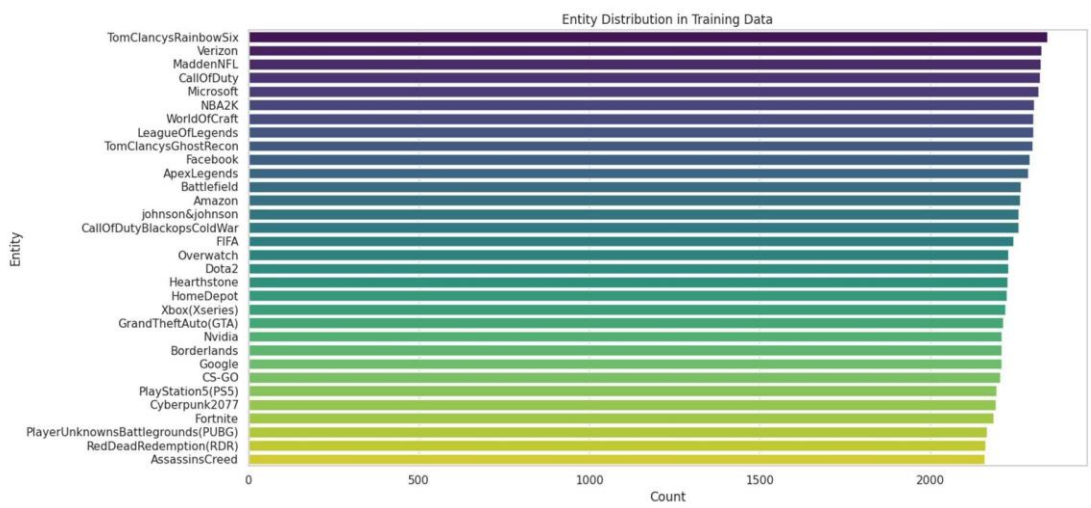

```python
# Bar Chart representation of top 10 most engaged entities on tweets
# Count the occurrences of each category
entity_counts = valid_data['Entity'].value_counts()

# Select the top 10 categories
top_10_entity = entity_counts.head(10)

# Define colors for the bars
colors = ['#1f77b4', '#ff7f0e', '#2ca02c', '#d62728', '#9467bd', '#8c564b', '#e377c2', '#7f7f7f', '#bcbd22', '#17becf']

# Plot a bar graph for the top 10 categories with colors
plt.figure(figsize=(10, 6))
top_10_entity.plot(kind='bar', color=colors)

# Remove the annotate part to not show values on top of each bar

plt.xlabel("Entities")
plt.ylabel('Tweet Count')
plt.title('Top 10 Entities with Highest Tweet Engagement')
plt.xticks(rotation=45, ha='right')  # Adjust rotation for better readability
plt.show()

#The highest tweet count is of RedDeadRedeemption entity which is 40, Lowest tweet count is of Fortnite.
```



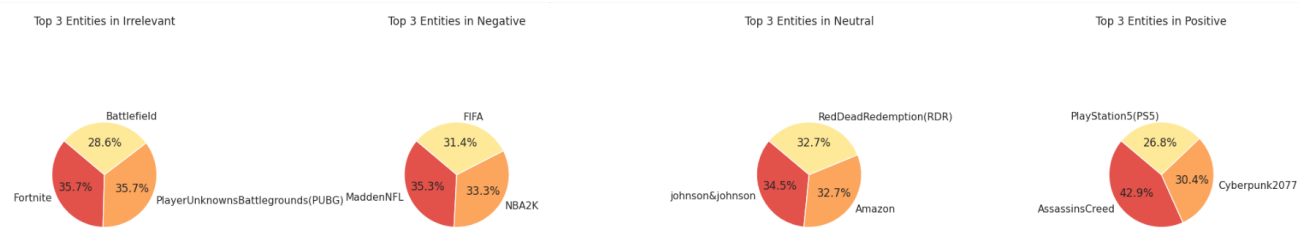

```python
#EXPLORATORY DATA ANALYSIS
#Pie Chart representation of sentiment distribution
# Count the occurrences of each category
category_counts =valid_data['Sentiment'].value_counts()

# Plot a pie chart
plt.figure(figsize=(6, 8))
plt.pie(category_counts, labels=category_counts.index, autopct='%1.1f%%', startangle=140)
plt.axis('equal')

plt.title('Distribution of Sentiments')
plt.show()

#There are 27.7% positive sentiment texts, 26.6% negative sentiment texts,
#17.1% Irrelevant sentiment texts and 28.5% neutral sentiment texts in the dataset
```




```
plt.figure(figsize=(15, 7))

# Plot entity distribution for training data
sns.countplot(data=train_data_cleaned, y=train_data_cleaned.columns[1], order=train_data_cleaned[train_data_cleaned.columns[1]].value_counts().index, palette='viridis')
plt.title('Entity Distribution in Training Data')
plt.xlabel('Count')
plt.ylabel('Entity')
plt.tight_layout()
plt.show()
```



```python
# Pie chart representation of the top three entities in each sentiment category
# Group the data by 'tweet_category' and 'entity' and count occurrences
category_entity_counts = valid_data.groupby(['Sentiment', 'Entity']).size().unstack(fill_value=0)

# Create a list to store the top 3 entities for each category
top_three_entities = []

# Iterate through each category
for category in category_entity_counts.index:
    top_entities = category_entity_counts.loc[category].nlargest(3)
    top_three_entities.append(top_entities)

# Determine the number of subplots based on the number of categories
num_categories = len(category_entity_counts.index)

# Create subplots for each category
plt.figure(figsize=(5 * num_categories, 5))
for i, (category, top_entities) in enumerate(zip(category_entity_counts.index, top_three_entities), start=1):
    plt.subplot(1, num_categories, i)
    plt.pie(top_entities, labels=top_entities.index, autopct='%1.1f%%', startangle=140)
    plt.axis('equal')
    plt.title(f'Top 3 Entities in {category}')

plt.tight_layout()
plt.show()
```

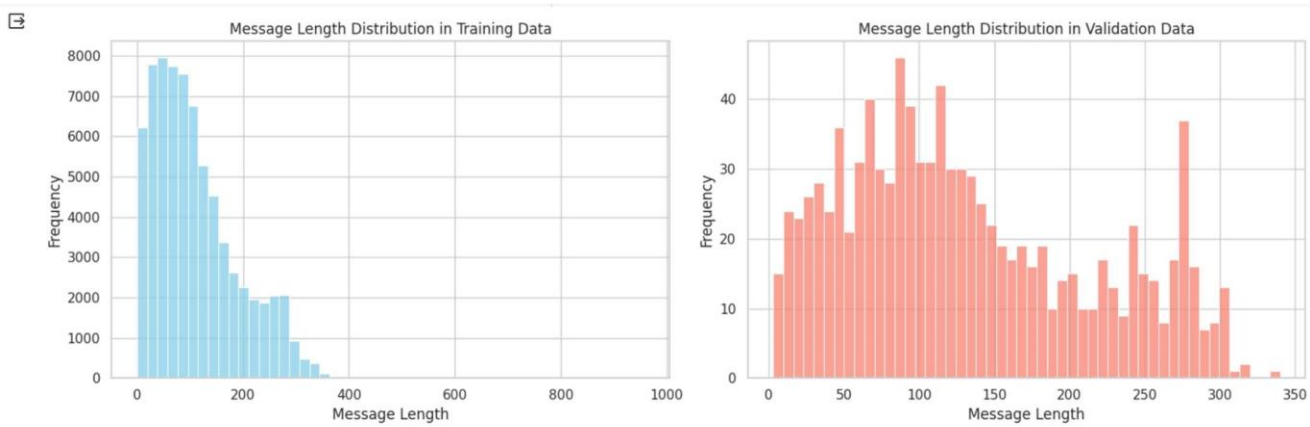


Building Basic Model & Testing:

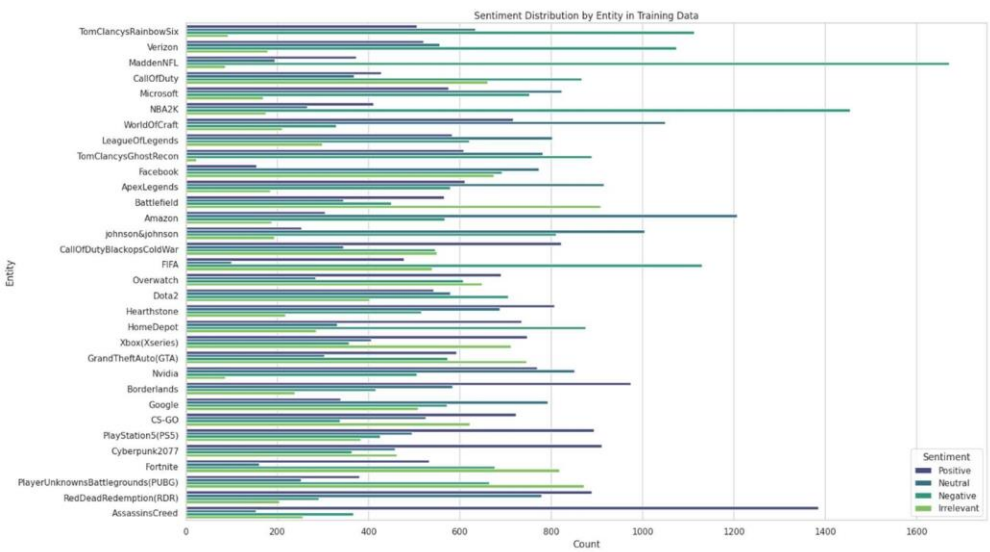
```python
train_data_cleaned['message_length'] = train_data_cleaned[train_data_cleaned.columns[3]].fillna('').apply(len)
valid_data['message_length'] = valid_data[valid_data.columns[3]].fillna('').apply(len)
```

[140]

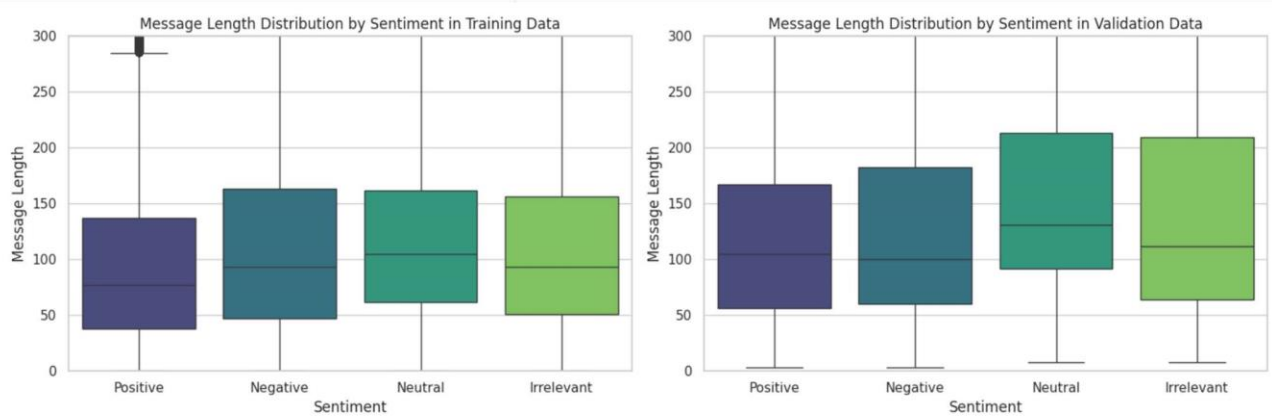
```python
fig, ax = plt.subplots(1, 2, figsize=(15, 5))

# Plot message length distribution for training data
sns.histplot(train_data_cleaned['message_length'], bins=50, ax=ax[0], color='skyblue')
ax[0].set_title('Message Length Distribution in Training Data')
ax[0].set_ylabel('Frequency')
ax[0].set_xlabel('Message Length')

# Plot message length distribution for validation data
sns.histplot(valid_data['message_length'], bins=50, ax=ax[1], color='salmon')
ax[1].set_title('Message Length Distribution in Validation Data')
ax[1].set_ylabel('Frequency')
ax[1].set_xlabel('Message Length')

plt.tight_layout()
plt.show()
```



```python
plt.figure(figsize=(18, 10))

# Plot sentiment distribution by entity
sns.countplot(data=train_data_cleaned, y=train_data_cleaned.columns[1], hue=train_data_cleaned.columns[2], order=train_data_cleaned[train_data_cleaned.columns[1]].value_counts().index, palette='viridis')
plt.title('Sentiment Distribution by Entity in Training Data')
plt.xlabel('Count')
plt.ylabel('Entity')
plt.legend(title='Sentiment')
plt.tight_layout()
plt.show()
```




```python
fig, ax = plt.subplots(1, 2, figsize=(15, 5))

# Plot message length distribution by sentiment for training data
sns.boxplot(data=train_data_cleaned, x=train_data_cleaned.columns[2], y='message_length', ax=ax[0], palette='viridis', order=['Positive', 'Negative', 'Neutral', 'Irrelevant'])
ax[0].set_title('Message Length Distribution by Sentiment in Training Data')
ax[0].set_ylabel('Message Length')
ax[0].set_xlabel('Sentiment')
ax[0].set_ylim(0, 300)

# Plot message length distribution by sentiment for validation data
sns.boxplot(data=valid_data, x=valid_data.columns[2], y='message_length', ax=ax[1], palette='viridis', order=['Positive', 'Negative', 'Neutral', 'Irrelevant'])
ax[1].set_title('Message Length Distribution by Sentiment in Validation Data')
ax[1].set_ylabel('Message Length')
ax[1].set_xlabel('Sentiment')
ax[1].set_ylim(0, 300)

plt.tight_layout()
plt.show()
```



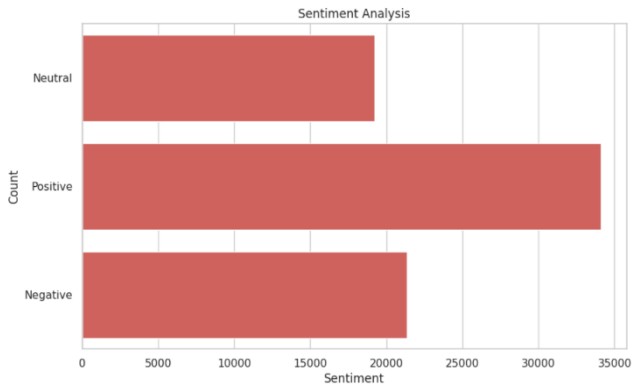
[143]

```python
# Define a function to handle non-string values
def analyze_sentiment(text):
    if isinstance(text, str):
        return TextBlob(text).sentiment.polarity
    else:
        return 0.0
```

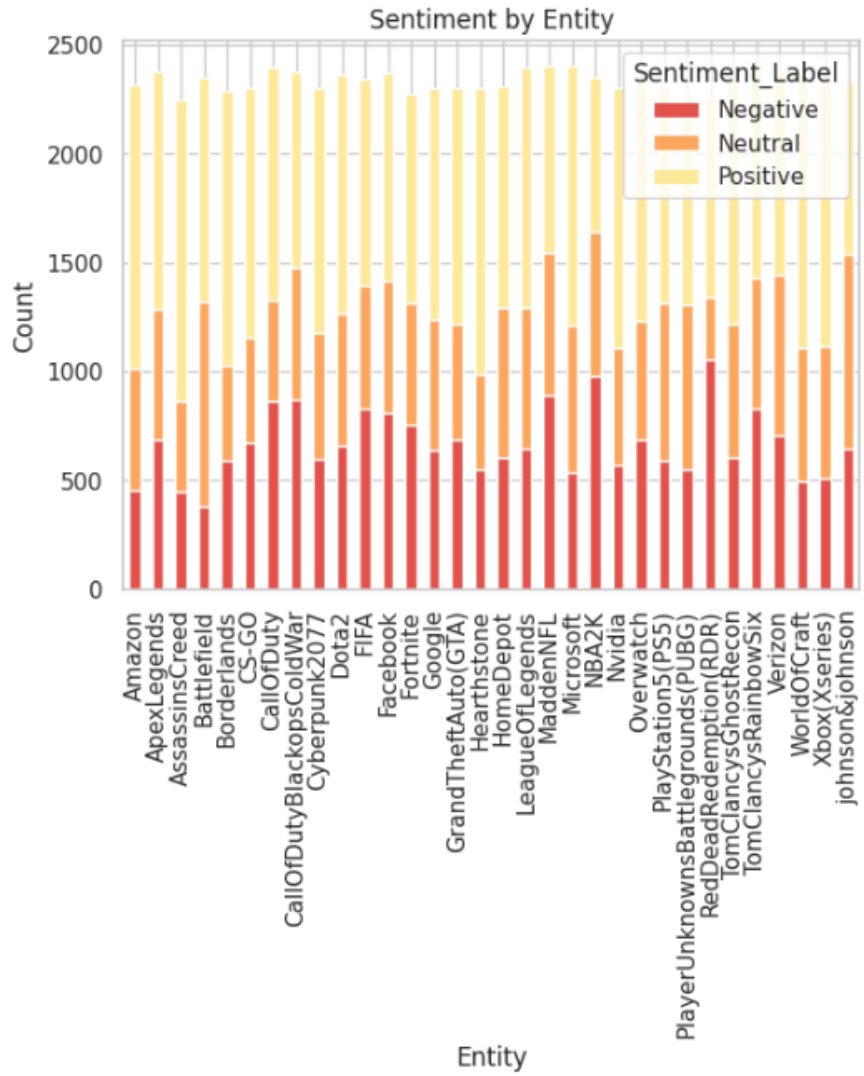
[144]
```python
# Perform sentiment analysis
train_data['Polarity'] = train_data['Tweet'].apply(analyze_sentiment)

# Categorize sentiment
train_data['Sentiment_Label'] = train_data['Polarity'].apply(lambda x: 'Positive' if x > 0 else 'Negative' if x < 0 else 'Neutral')
```

[145]
```python
# Perform sentiment analysis
valid_data['Polarity'] = valid_data['Tweet'].apply(analyze_sentiment)

# Categorize sentiment
valid_data['Sentiment_Label'] = valid_data['Polarity'].apply(lambda x: 'Positive' if x > 0 else 'Negative' if x < 0 else 'Neutral')
```

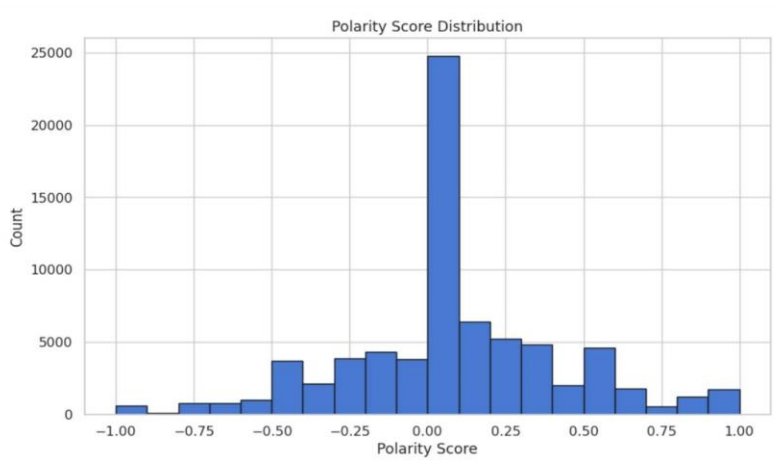
```python
# Analyze sentiment distribution
plt.figure(figsize=(10, 6))
sns.countplot(train_data['Sentiment_Label'])
plt.title('Sentiment Analysis')
plt.xlabel('Sentiment')
plt.ylabel('Count')
plt.show()
```



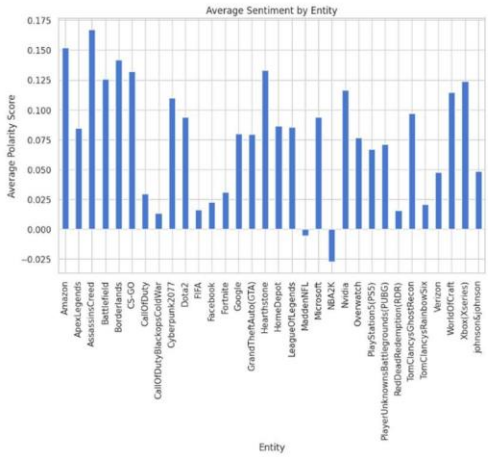

```python
# Analyze sentiment by topic
plt.figure(figsize=(15,8))
sentiment_by_topic = train_data.groupby(['Entity', 'Sentiment_Label']).size().unstack(fill_value=0)
sentiment_by_topic.plot(kind='bar', stacked=True)
plt.title('Sentiment by Entity')
plt.xlabel('Entity')
plt.ylabel('Count')
plt.show()
```




```
plt.figure(figsize=(10, 6))
plt.hist(train_data['Polarity'], bins=20, edgecolor='k')
plt.title('Polarity Score Distribution')
plt.xlabel('Polarity Score')
plt.ylabel('Count')
plt.show()
```



```python
plt.figure(figsize=(10, 6))
average_polarity_by_topic = train_data.groupby('Entity')['Polarity'].mean()
average_polarity_by_topic.plot(kind='bar')
plt.title('Average Sentiment by Entity')
plt.xlabel('Entity')
plt.ylabel('Average Polarity Score')
plt.show()
```




```python
# Visualize the most positive and negative tweets
most_positive_tweet = train_data[train_data['Polarity'] == train_data['Polarity'].max()]['Tweet'].values[0]
most_negative_tweet = train_data[train_data['Polarity'] == train_data['Polarity'].min()]['Tweet'].values[0]

print('Most Positive Tweet:')
print(most_positive_tweet)

print('\nMost Negative Tweet:')
print(most_negative_tweet)
```

```
Most Positive Tweet:
Platinum is the best loot @Borderlands

Most Negative Tweet:
"What terrible bitch!"
```

```python
# Visualize the most positive and negative tweets
most_positive_tweet = valid_data[valid_data['Polarity'] == valid_data['Polarity'].max()]['Tweet'].values[0]
most_negative_tweet = valid_data[valid_data['Polarity'] == valid_data['Polarity'].min()]['Tweet'].values[0]

print('Most Positive Tweet:')
print(most_positive_tweet)

print('\nMost Negative Tweet:')
print(most_negative_tweet)
```

```
Most Positive Tweet:
Best squad yet#pubg #pubgmobile #pubgkenya instagram.com/p/B-Obt_eAA4f/…

Most Negative Tweet:
@EAMaddenNFL franchise and face of the franchise are both terrible. @NFL #NFLdropEA #NFLDROPSEA
```